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CLAIMS

What is claimed is:

1. A method for designing a system on a target device utilizing field programmable gate arrays (FPGAs), comprising:

synthesizing a design for the system;

mapping components in the design onto resources on the target device;

determining placement locations for the components on the target device; and

identifying components to replicate in response to criticality determined from the placement locations.

2. The method of Claim 1, wherein identifying components to replicate comprises identifying a replication candidate with associated slack that exceeds a threshold value.

3. The method of Claim 2, further comprising determining a location for a duplicate of the replication candidate.

4. The method of Claim 3, further comprising determining slack gain associated with the duplicate of the replication candidate at the location.

5. The method of Claim 4, further comprising computing a gain value for the duplicate of the replication candidate.

6. The method of Claim 5, wherein computing the gain value comprising evaluating slack gain, the associated slack of the replication candidate, and illegalities associated with placement at the location.

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7. The method of Claim 5, further comprising designating n components with a highest gain value as the components to replicate.

8. The method of Claim 1, further comprising performing incremental placement on duplicates of the components to replicate.

9. The method of Claim 8, further comprising:

identifying additional components to replicate; and

performing incremental placement on the duplicates of the additional components to replicate.

10. The method of Claim 8, further comprising routing the components and the duplicates of the components to replicate.

11. The method of Claim 1, further comprising removing a duplicate if a location of the duplicate is in a logic array block with its corresponding component to replicate.

12. The method of Claim 8, further comprising determining system slack for the system.

13. The method of Claim 12, further comprising restoring the system to its previous design if the system slack has decreased.

14. A method for designing a system on a target device utilizing field programmable gate arrays (FPGAs), comprising:

determining placement locations for components on the target device;

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identifying components to replicate in response to criticality determined from the placement locations; and

performing incremental placement to resolve an illegality in placement of a duplicate of a component to replicate.

15. The method of Claim 14, wherein identifying components to replicate comprises identifying a replication candidate with associated slack that exceeds a threshold value.

16. The method of Claim 15, further comprising determining a location for a duplicate of the replication candidate.

17. The method of Claim 16, further comprising determining slack gain associated with the duplicate of the replication candidate at the location.

18. The method of Claim 17, further comprising computing a gain value for the duplicate of the replication candidate.

19. The method of Claim 18, wherein computing the gain value comprising evaluating slack gain, the associated slack of the replication candidate, and illegalities associated with placement at the location.

20. The method of Claim 18, further comprising designating n components with a highest gain value as the components to replicate.

21. The method of Claim 14, wherein performing incremental placement to resolve illegalities in placement of duplicates of the components to replicate comprises:

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generating a proposed move for the duplicate;

generating cost function values for a current placement with the proposed move; and

accepting the proposed move if its associated cost function value is better than the cost function value of the current placement.

22. The method of Claim 21, wherein generating the proposed move comprises moving the duplicate to a logic-array block (LAB) that is a fanin of the duplicate.

23. The method of Claim 21, wherein generating the proposed move comprises moving the duplicate to a logic-array block (LAB) that is a fanout of the duplicate.

24. The method of Claim 21, wherein generating the proposed move comprises moving the duplicate to a logic-array block (LAB) that is a sibling of a LAB where the duplicate resides.

25. The method of Claim 21, wherein generating the proposed move comprises moving the duplicate to a logic-array block (LAB) that is adjacent to the duplicate.

26. A machine-readable medium having stored thereon sequences of instructions, the sequences of instructions including instructions which, when executed by a processor, causes the processor to perform:

synthesizing a design for a system;

mapping components in the design onto resources on a target device;

determining placement locations for the components on the target device; and

identifying components to replicate in response to criticality determined from the placement locations.

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27. The machine-readable medium of Claim 26, wherein identifying components to replicate comprises identifying a replication candidate with associated slack that exceeds a threshold value.

28. The machine-readable medium of Claim 27, further comprising instructions which when executed further performs determining a location for a duplicate of the replication candidate.

29. The machine-readable medium of Claim 28, further comprising instructions which when executed further performs determining slack gain associated with the duplicate of the replication candidate at the location.

30. The machine-readable medium of Claim 29, further comprising instructions which when executed further performs computing a gain value for the duplicate of the replication candidate.

31. The machine-readable medium of Claim 30, wherein computing the gain value comprising evaluating slack gain, the associated slack of the replication candidate, and illegalities associated with placement at the location.

32. The machine-readable medium of Claim 30, further comprising instructions which when executed further performs designating n components with a highest gain value as the components to replicate.

33. The machine-readable medium of Claim 26, further comprising performing incremental placement on duplicates of the components to replicate.

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34. The method of Claim 1, wherein identifying components to replicate comprises identifying a replication candidate with associated path delay that exceeds a threshold value.